Design of a Normative Spring Rise, Lower Missouri River - Addendum 1

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This document is an addendum to the document "Design of a Normative Spring Rise, Lower Missouri River" (ver. 0.1, design_expalnation.pdf, 7/11/2005). In this document we present a narrower range of flow scenarios based on discussions by the Pallid Sturgeon Working Group (PSWG) during a teleconference 7/13/2005. The logic for selecting these alternatives is a) that they are based on design parameters extracted from the natural, reference hydrograph and b) they represent a range of conditions relevant to low flows on the Missouri River. The table shows scenarios based on 12.5 – 50th percentiles of relative rising peak and duration (that is, parameters related to the size of the spring pulse) extracted from the reference hydrograph for years representing the lower third of annual runoff. The first four columns show design parameters with relative rising peak and duration varying by percentile while the peak dates are held constant at the 50th percentile. Columns 5-8 show the same but with peak dates set at the 25th percentile. Earlier peaks were considered in the design scenarios because of potential conflicts of later peaks with nesting of terns and plovers. The range of scenarios under consideration is appreciable: relative peaks range 6-26 kcfs, and estimated excess drafting from storage range 0.272 – 1.5 MAF. These scenarios have been forwarded to the Corps for potential modeling using the daily routing and perhaps other models.

		50%tile DATES				25%tile DATES			
		%tiles				%tiles			
Environmental Flow Component		0.125	0.25	0.375	0.5	0.125	0.25	0.375	0.5
Peak Date, day of year	EARLY PEAK	88	88	88	88	80	80	80	80
Peak Date		3/28	3/28	3/28	3/28	3/20	3/20	3/20	3/20
Relative Rising Peak, kcfs		6.38	10.75	16.7	21.88	6.38	10.75	16.7	21.88
Duration, days		10	15.5	18	22.5	10	15.5	18	22.5
days fall		5.0	8.5	10.0	12.9	5.0	8.5	10.0	12.9
days rise		3.0	5.0	6.0	7.6	3.0	5.0	6.0	7.6
start date		3/25	3/22	3/22	3/20	3/17	3/14	3/14	3/12
end date		4/4	4/7	4/9	4/11	3/27	3/30	4/1	4/3
Peak Date, day of year	LATE PEAK	163	163	163	163	145	145	145	145
Peak Date		6/11	6/11	6/11	6/11	5/24	5/24	5/24	5/24
Relative Rising Peak, kcfs		11.61	14.415	18.8	26.36	11.61	14.415	18.8	26.36
Duration, days		15	19	28	35	15	19	28	35
days fall		8.2	10.7	16.0	20.7	8.2	10.7	16.0	20.7
days rise		4.8	6.3	9.5	12.3	4.8	6.3	9.5	12.3
start date		6/6	6/4	6/1	5/29	5/19	5/17	5/14	5/11
end date		6/21	6/23	6/28	7/3	6/3	6/5	6/10	6/15
MAF > baseline		0.272	0.482	0.891	1.512	0.272	0.482	0.891	1.512

The following figures illustrate the schematic hydrographs based on these design parameters and the assumptions noted in the earlier design_explanation.pdf document. NOTE: the vertical axis scale has been changed to illustrate the differences among these alternatives. Another difference is that the Biop Default line has been recalculated. Discharges in the summer have been reduced to minimum service navigation to portray likely values during drought. The vertical bars for estimated nesting constraints of turns and plovers have been altered to show estimated dates of rise and peak. The nesting constraints and Biop Default values are estimates and are provided for comparison only. Another difference in this version of figures is that the baseline discharge has been altered to provide a better depiction of discharges needed from Gavins Point to maintain minimum service navigation during drought years. The baseline values were calculated by prorating the lower-quartile discharge values found in table IV in the 2005 Annual Operating Plan. All pulse discharges were added to the baseline to create the schematic hydrographs in figures 17 and 18.

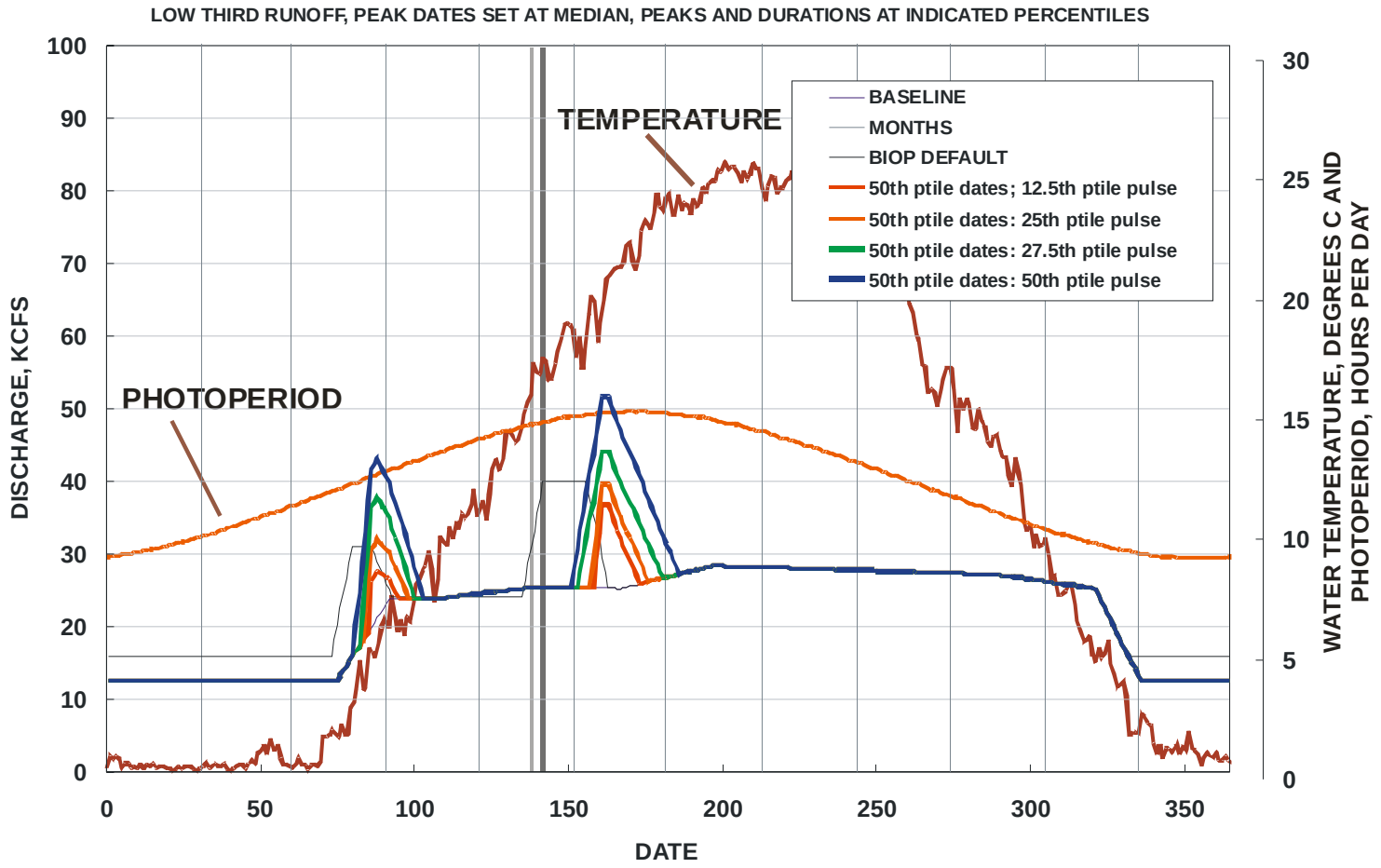

Figure 17. Synthetic hydrographs based on second iteration with input from pallid sturgeon experts. The reference hydrograph data are taken from the lower third of annual runoff. Peak dates set to median for each pulse. The relative rising peak discharge and duration are calculated from percentiles of reference hydrograph, using the 12.5, 25, 37.5, and 50th percentiles. The rate of rise and rate of fall were calculated to achieve set duration, however the ratio of rate of rise to rate of fall was set by median ratio in the reference hydrograph. The thin, light-gray vertical lines depict months of the year. The thick light and dark gray lines are estimates of the limiting dates for initiation and peak of the second rise that would avoid take of nesting terns and plovers. The light gray line is set at May 19 and the dark gray line is set at May 22. Note that the vertical scale is much reduced from earlier figures.

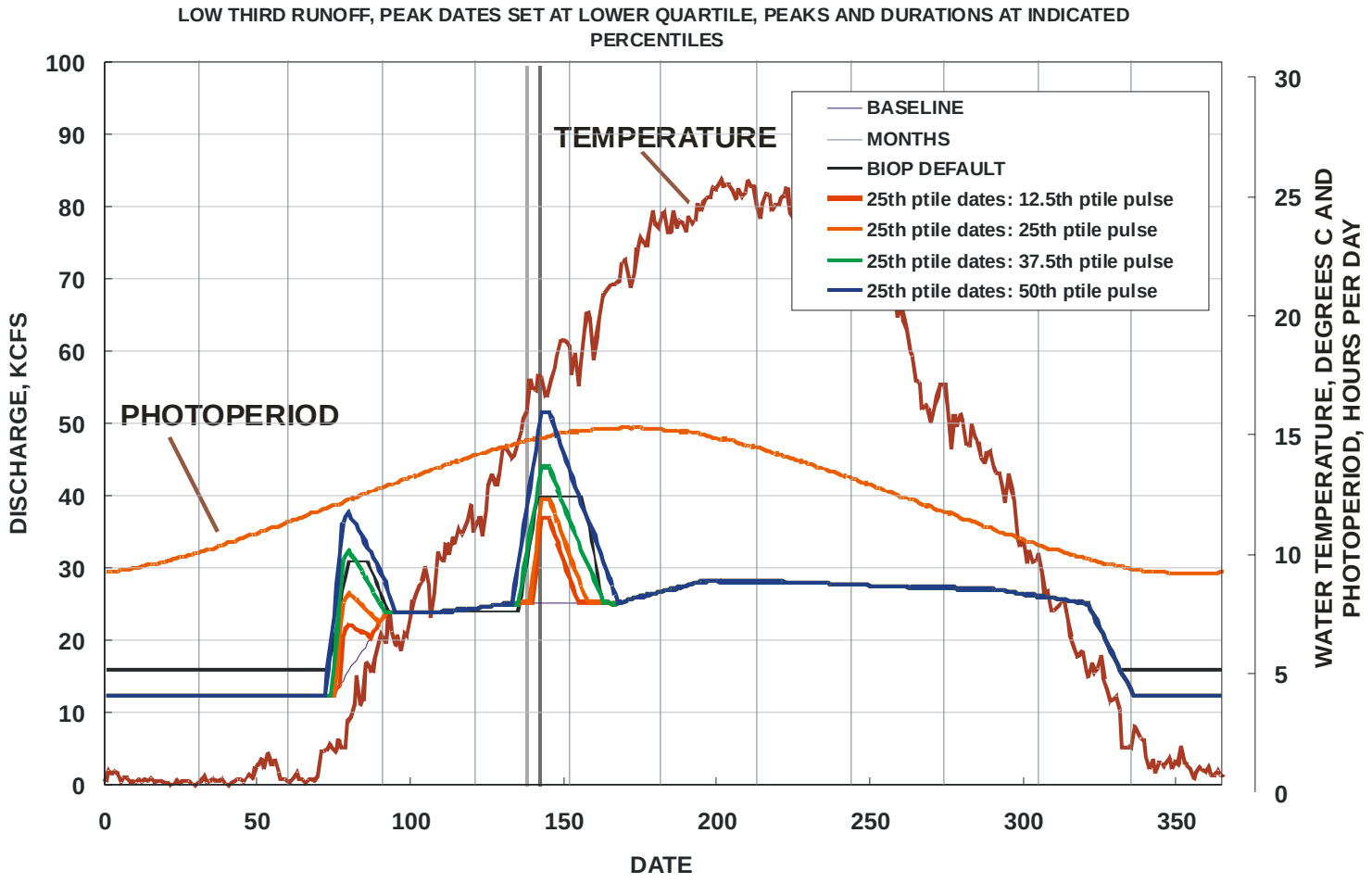

Figure 18. Synthetic hydrographs based on second iteration with input from pallid sturgeon experts. The reference hydrograph data are taken from the lower third of annual runoff. Peak dates set to 25th percentile for each pulse. The relative rising peak discharge and duration are calculated from percentiles of reference hydrograph, using the 12.5, 25, 37.5, and 50th percentiles. The rate of rise and rate of fall were calculated to achieve set duration, however the ratio of rate of rise to rate of fall was set by median ratio in the reference hydrograph. The thin, light-gray vertical lines depict months of the year. The thick light and dark gray lines are estimates of the limiting dates for initiation and peak of the second rise that would avoid take of nesting terns and plovers. The light gray line is set at May 19 and the dark gray line is set at May 22. Note that the vertical scale is much reduced from earlier figures.